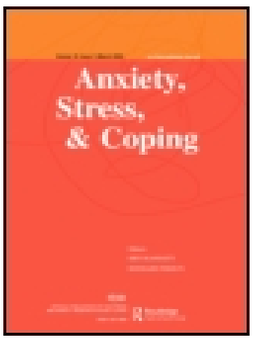

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REVIEW

Effects of mask-wearing on social anxiety: an exploratory review

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ABSTRACT

Background: A unique feature of the global coronavirus pandemic has been the widespread adoption of mask-wearing as a public health measure to minimize the risk of contagion. Little is known about the effects of increased mask-wearing on social interactions, social anxiety, or overall mental health.

Objectives: Explore the potential effects of mask-wearing on social anxiety.

Design: We review existing literatures to highlight three preselected sets of factors that may be important in shaping the effects of mask-wearing on social anxiety. These are: (a) people's perceptions of the social norms associated with wearing masks; (b) people's experiences of the degree to which masks prevent accurate interpretation of social and emotional cues; and (c) people's use of masks as a type of *safety behavior* that enables self-concealment.

Methods: APA PsycNet and PubMed were searched principally between September and November 2020 for articles describing the relationship between social anxiety, intolerance of uncertainty, ambiguous feedback, and safety behavior use and for research on the relationship between mask-wearing and social norms and social interactions. Information identified as relevant from articles of interest was extracted and included in our review.

Results & Conclusions: The effects of mask-wearing on social anxiety are likely to be substantial and clinically relevant.

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Mask-wearing; masks; COVID-19; social anxiety; social norms; safety behaviors

The adverse effects of the COVID-19 pandemic on mental health outcomes, including anxiety and depression, have been well-documented (e.g., Asmundson et al., 2020; Benatti et al., 2020; Dozois & Mental Health Research Canada, 2020; Rossi et al., 2020). A unique feature of the global coronavirus pandemic has been the rapid and widespread adoption of mask-wearing as a public health measure to minimize the risk of contagion. Guided by contemporary theoretical models of social anxiety (SA) and current research, this review explores the potential implications of increased mask-wearing on SA.

The effects of mask-wearing on SA are currently unknown. At its core, the experience of SA is characterized by negative self-perception and fear of negative evaluation (e.g., Clark & Wells, 1995; Hofmann, 2007; Moscovitch, 2009; Rapee & Heimberg, 1997). In this review, we focus on three aspects of mask-wearing that may be expected to impact SA in unique ways. First, we highlight evidence that mask-wearing within certain contexts represents a sign of conformity with accepted social norms and we explore whether the choice to mask (or not to mask) oneself within particular social situations might affect levels of SA through the perception of how one's choice may align with or violate social norms. Second, we examine how the effects of mask-wearing may interfere with

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interpretations of other people's emotional expressions, thus serving as a potential barrier to a valuable source of social information and feedback for individuals with higher levels of SA who may already struggle to interpret social cues in accurate ways. Third, we explore the extent to which mask-wearing could be conceptualized as a form of *safety behavior* that may increase the ease of social interaction for those with higher levels of SA by virtue of its self-concealing function, which may, in turn, also impair certain aspects of social functioning. As part of this discussion, we highlight potential implications of COVID-related restrictions on socialization for people with SA, as well as for people with comorbid social and health anxiety. We conclude by emphasizing the continued relevance of these issues for the transition to a post-pandemic era in which mask-wearing is likely to persist for segments of the population within certain contexts as a matter of personal choice. Our implicit assumption throughout the paper is that understanding how mask-wearing impacts SA can also help to inform the clinical assessment and treatment of social anxiety disorder (SAD), an extreme manifestation of SA that represents the most prevalent anxiety disorder, estimated to affect up to 13% of the population at some point in their lives (Kessler et al., 2012).

Literature search

Unlike a systematic review, which aims to be comprehensive in its coverage of all aspects of a particular topic, our exploratory review aimed to be selective and brief in its coverage by focusing on features of SA that we decided, a priori, would potentially be influenced by mask-wearing. Based on theoretical models of SA, we identified (a) hypersensitivity to social norms, (b) biases in detection of social and emotional facial cues, and (c) propensity for self-concealment as these facets. To this end, we extracted relevant articles individually from PubMed and APA PsycNET that investigated the relationship between SA and sensitivity to social norms, as well the effects of ambiguous feedback, uncertainty, and safety behavior use on SA. Select research describing facial processing in SA was also included. Additional searches on these databases were performed to identify the effects of masks and facial occlusion on communication, trends in mask-wearing during the COVID-19 pandemic, and the role of perceived social norms in mask-wearing compliance. The insights of relevant articles were assimilated to inform hypotheses about how various aspects of mask-wearing might interact with SA. Literature searches were performed primarily between September and November 2020; however, some relevant literature published beyond this time frame was included during the process of revising this article. Article relevance was defined in a non-systematic manner based on the subjective perceptions of the authors. Table 1 provides an overview of the COVID-19-related research included in our discussion.

Social norms surrounding the use of masks

Social norms are beliefs held by a group of people regarding acceptable behavior, which in turn influence action (McDonald & Crandall, 2015). SA is driven, fundamentally, by the fear that one's appearance or behavior will fail to conform with social expectations and norms (see Clark & Wells, 1995; Hofmann, 2007; Moscovitch, 2009; Rapee & Heimberg, 1997). Indeed, people with SA worry they will be observed and judged for "behaving in an inept and unacceptable fashion" (p. 69; Clark & Wells, 1995), and have "excessive fear of violating social norms" (p. 1124; Hofmann et al., 2010). In support of this conceptualization of SA, research has established a clear association between SA and heightened concern about violating social norms or behaving in ways that might call unwanted attention to themselves. For example, a study of 908 participants from eight countries who evaluated behaviors described in vignettes of social situations found that SA was significantly correlated with decreased acceptance of attention-seeking behaviors (Heinrichs et al., 2006), both for participants' own conduct and for their perceived cultural acceptability in general. In another study, Moscovitch et al. (2015) presented three groups of participants – individuals

Table 1. Summary of COVID-19-related studies included in literature review, organized by theme.

Author(s)	Sample & methods	Data collection period	Relevant finding(s)
Theme: Social norms surrounding mask-wearing			
Betsch et al. (2020)	*N*=925 German residents.	26–27 May	Participants perceived another person presented in a hypothetical grocery shopping scenario as more prosocial when they were masked.
Clements (2020)	*N*=1043 United States (US) residents	17 March	Self-identified Republicans were more likely to report medical mask-wearing than both self-identified Democrats (48% lower odds) and Independents (66% lower odds). Higher educational attainment was associated with marked increases in mask-wearing likelihood.
Godbersen et al. (2020)	*N*=663 German post-secondary students	25 March–15 April	The perceived the feasibility and efficacy of coronavirus protective measures as well as perceived subjective norms influenced people's evaluations of coronavirus protective measures. The perceived efficacy of the measures was the most important factor in people's evaluation of them, followed by the measures' perceived feasibility, followed by subjective norms surrounding the measure.
Haischer et al. (2020)	*N* = 9935, grocery-store clients in Wisconsin, USA Observational design.	3 June–3 August	During the period substantially before the enactment of store- or state-mandated mask policies (June 2020), shoppers identified as female wore masks in grocery stores more often than those identified as male. Shoppers judged to be older had greater odds of mask-wearing in grocery stores.
Hearne and Niño (2021)	*N*=4688 US residents Cross-sectional, online or phone survey (National Opinion Research Center, ND.)	20 April–8 June	Black, Latinx, and Asian respondents had respective odds ratios of 2.24, 1.62 and 2.87 of mask-wearing compared to White respondents during the coronavirus pandemic. Men and younger respondents were less likely to wear masks compared to women and older respondents, respectively. Inter-regional differences in mask-wearing were observed.
Howard (2020) *Study 1*	*N*=205 US residents	26 April	Main themes identified as reasons people refrain from mask-wearing were: Concerns about the (1) comfort, (2) efficacy, (3) convenience, (4) necessity (5) appearance of, or (6) access to facemasks, and concerns about the (7) negative social attention or (8) infringement of freedom related to mask-wearing.
Nakayachi et al. (2020)	*N*=1000 Japanese individuals	26–31 March	Respondents' perception of mask-wearing as a social norm had the largest correlation with reported mask-wearing frequency compared to respondents' perceived cost of catching COVID, the perceived protective value of masks, the perceived efficacy of masks, the comfort garnered from wearing a mask, and the motivation to avoid

(*Continued*)

Table 1. Continued.

Author(s)	Sample & methods	Data collection period	Relevant finding(s)
			COVID-19. All variables were positively correlated with reported mask-wearing frequency.
Rader et al. (2021)	*N*=378207 US residents	3 June–27 July	White respondents reported the least engagement in mask-wearing (compared to Black, Hispanic, and Other). Women were more likely to report mask-wearing than men and older age was associated with more self-reported mask-wearing. Location within the United states (by census division) was also significantly associated with self-reported mask-wearing.
Wang et al. (2020)	*N*=2266 residents of Poland (*N* = 1056) and China (*N*=1210)	China: 31 January–2 February, Poland: 22–26 March	96.8% of Chinese respondents reported wearing a mask in the past 14 days compared to 35.0% of Polish respondents.
Xu and Cheng (2021)	*N*=233 US residents	10 August	Liberal political orientation was significantly associated with positive attitudes towards mask-wearing and engagement in mask-wearing.
Theme: Effects of mask-wearing on the ambiguity of social interactions			
Carbon (2020)	*N*=41 German Individuals	15–18 May	Participants' accuracy in assessing emotions displayed by a target face was decreased when the face was masked, except for when the face was displaying a fearful or neutral expression. Participants were less confident in their correct assessments of the target face's emotion across all emotion conditions when the target face was masked.
Saunders et al. (2020)	*N*=460 United Kingdom (UK) residents. Individuals with impaired hearing were oversampled.	8 June–5 August	The majority of respondents indicated increased difficulty hearing and decreased engagement in a conversation when the other person was masked, across hearing abilities.
Theme: Effects of coronavirus pandemic on mental health outcomes			
Asmundson et al. (2020)	*N*=1568 Canadian and US residents	21 March–1 April	Respondents with self-reported primary anxiety-related disorders reported significantly higher levels of anxiety related to COVID-19 and self-isolation (where applicable) than did those with a self-reported primary mood disorder, or those who did not report a current mental health diagnosis. The latter two groups did not differ significantly in coronavirus anxiety, but those with a primary mood disorder reported greater self-isolation-related stress (where applicable) than those without a current mental health diagnosis.
Benatti et al. (2020)	*N*=123 Italian individuals with obsessive-compulsive disorder (OCD) Methods: Telephone or in-person psychiatric interview.	Unreported	35.8% of participants exhibited a clinical worsening of OCD symptoms associated with the COVID-19 pandemic.
Dozois and Mental Health Research Canada (2020)	*N*=1803 Canadians	22–28 April	Increases in self-reported anxiety and depression since the pandemic onset were observed for respondents with and without a self-reported mental

(*Continued*)

Table 1. Continued.

Author(s)	Sample & methods	Data collection period	Relevant finding(s)
			health diagnosis. Over one quarter of the sample reported increases in alcohol and cannabis consumption since the onset of the pandemic, respectively.
Hawes et al. (2021)	*N* = 451 residents of Long Island, New York, adolescents and younger adults. Longitudinal (within-subjects) design, digital survey.	Initial: December 2014–July 2019. Follow-up: 27 March–15 May 2020	There was a main positive effect of the pandemic on symptoms of depression, somatic/panic, general anxiety and SA. For panic/somatic and depressive symptoms, this effect was driven by female respondents. Concerns about infection and school were positively associated with SA, while concerns about being confined to the home were negatively associated with SA.
Ho and Moscovitch (2021)	*N* = 488 Canadian and US residents	28 May	Self-reported pre-pandemic SA was positively correlated with coronavirus anxiety. This relationship was moderated by both severity of COVID-19-related stressors and levels of pre-existing social-anxiety-related impairment, such that at low levels of stressors and impairment the relationship between SA and coronavirus anxiety was nonsignificant. Higher levels of pre-pandemic SA corresponded to an increased fear of negative evaluation resulting from social distancing within the COVID-19 pandemic.
Rossi et al. (2020)	*N*=18147 Italian citizens	27 March–6 April	17.3% and 20.8% of respondents met the defined cut-offs for depression and anxiety, respectively. Percentages of respondents meeting defined cut-offs for adjustment disorder, high perceived stress and post-traumatic stress symptoms were between 21% and 37%. The rate for insomnia was 7.3%.
Szczesniak et al. (2020)	*N*=2040 Polish Individuals surveyed before (*N*=564) and after (*N*=1476) enactment of face mask restrictions in Poland.	16 March–26 April	Respondent scores on measures of social dysfunction, depression, somatic symptoms, and anxiety and insomnia decreased following enactment of face mask restrictions.

Note: Cross-sectional, online surveys were used for data collection unless otherwise indicated. Year of data collection was 2020 for all studies. Only studies that collected original data pertaining to COVID-19 are included in this table.

with SAD, individuals with an anxiety disorder other than SAD, and individuals without any psychiatric diagnosis – with vignettes describing unintentional yet realistic and commonplace social blunders (e.g., tripping in front of a romantic interest). They found that participants with SAD rated social blunders to be both more costly and more shame-inducing than either control group, but only when participants imagined committing the blunders themselves. These inflated cost estimates were associated with a stronger belief that committing a blunder was likely to expose something unattractive about the self. Using a similar paradigm, Bas-Hoogendam et al. (2018) found that SA was associated with higher ratings of inappropriateness and embarrassment related to accidental social blunders. Interestingly, a study by Blair et al. (2010) showed that participants with higher SA exhibited greater fMRI brain activation in areas of the medial prefrontal cortex during the processing of accidental norm violations than during the processing of intentional social norm violations. These

findings highlight that sensitivities to the costs of social norm violations in people with high levels of SA can be detected by both subjective and neurological measures (Bas-Hoogendam et al., 2017).

In the context of the COVID-19 pandemic, studies have documented the relevance of subjective norms for understanding people's adherence to sanitary measures (e.g., Godbersen et al., 2020). Within this context, it is likely that mask-wearing in and of itself may qualify as a social norm. Engagement in mask-wearing appears to differ between social groups, elicit social judgments from others, and depend on perceived social acceptability. For example, the degree of mask-wearing varies with gender and age groups. Data from the United States consistently indicate that women and older individuals are more likely to wear masks than men and younger individuals (Haischer et al., 2020; Hearne & Niño, 2021; Rader et al., 2021). Significant differences in mask-wearing by race in the United states have also been observed, demonstrating that White individuals are less likely than individuals of minority racial groups to wear a mask (Hearne & Niño, 2021; Rader et al., 2021). More specifically, Hearne and Niño (2021) reported that Black, Latinx and Asian individuals, respectively, had 124%, 62% and 187% increased odds of mask-wearing during the COVID-19 pandemic compared to White individuals. Individuals with greater educational attainment may also be more likely to wear masks (Clements, 2020). Moreover, survey data from the United States demonstrated that mask-wearing varies with political affiliation; while data from early in the pandemic suggested that Republicans were more likely to wear masks compared to Democrats (Clements, 2020), later data indicated that a more liberal political orientation is associated with greater mask-wearing (Xu & Cheng, 2021). Last, on the global scale, engagement in mask wearing varies by nation. For example, over 95% of Chinese respondents surveyed had recently worn a mask, in contrast with 35% of Polish respondents surveyed (Wang et al., 2020). In sum, mask-wearing varies meaningfully across demographic and social groups and this variance may be accounted for, at least in part, by variation in the degree to which mask-wearing is perceived as socially normative.

Further qualifying mask-wearing as a social norm is evidence that people's mask-wearing behavior elicits social judgments from others (Betsch et al., 2020; Burgess & Horii, 2012). For example, when German participants were asked to imagine shopping during the COVID-19 pandemic alongside another person who was either masked or not masked, they perceived the masked person as being more prosocial (Betsch et al., 2020). Similarly, Szczesniak et al.'s (2020) survey of Polish individuals demonstrated that indicators of general mental health and wellbeing improved in the period after the adoption of mandatory mask wearing restrictions, which they speculated may have been due, at least in part, to a heightened sense of social unity associated with following mask-wearing directives as a way to express communal responsibility for combatting the pandemic. Indeed, prior research has shown that social judgments can influence the extent to which people engage and comply with mask-wearing directives (Sim et al., 2014).

Perhaps most convincing in the qualification of mask-wearing as a social norm is the evidence that mask-wearing behavior is more influenced by perceived descriptive norms (i.e., whether or not people believe others are wearing masks) than it is by the perceived protective value of masks (Nakayachi et al., 2020). To this end, one news story from the height of the pandemic in the United States highlighted that in some areas of the country, the majority of people always wear masks, while in others the majority may never wear masks (Katz et al., 2020). Moreover, in one survey of Western, English-speaking respondents, 13% cited the "negative social attention" (p. 4) related to mask-wearing as a reason for not wearing them (Howard, 2020). Given the body of literature indicating that individuals with SA exhibit a heightened sensitivity to social norms, and that which suggests that mask-wearing may at times be counter-normative, it follows that mask-wearing in such cases may be associated with heightened levels of distress in people with higher SA.

Furthermore, the expression of SA is subject to variation with the broader socio-cultural context in which it is observed; in collectivistic cultures such as Japan, a form of SA called *Taijin Kyofusho* is manifest and characterized by a fear of offending others (Kleinknecht et al., 1997), rather than a fear of negative social evaluation. It is possible, then, that in disparate social contexts where

mask-wearing is perceived as anti-normative, SA may also manifest differently. For example, although individuals with SA may generally orient towards mask-wearing because comfort is derived from facial concealment (discussed in more detail later), in social contexts where mask-wearing is perceived as undesirable, remaining unmasked may be perceived as the least distressing option for people with higher SA.

How might social norm violations contribute to increased distress in individuals with greater SA? Research points to the importance of self-focused attention in the transgressor (see Spurr & Stopa, 2002). For example, in the study by Moscovitch et al. (2015; described above), although participants with a diagnosis of SAD were more embarrassed by imagined social blunders compared to participants with another type of anxiety disorder, this was only true when the blunders were committed by themselves versus others, implicating a focus on the self in the negative feelings associated with anti-normative behavior, and supporting the notion that people with SAD fear that social norm transgressions will expose perceived core flaws in the transgressor (Moscovitch et al., 2015). Using a similar paradigm, Fung et al. (2016) reported that the perceived negative consequences of social blunders can be reduced when contextual information unrelated to the blunder is emphasized, suggesting that redirecting participants' attention from the self to external aspects of the situation may help to reduce sensitivities to the potential costs of social norm violations for people with higher SA. At the neurological level, studies have shown that while distress-related cerebral activation in the medial prefrontal cortex is generally enhanced among individuals with higher levels of SA when processing social norm transgressions, concurrent activation in brain areas related to self-referential thought is especially robust when the blunders they imagine committing are unintentional (Bas-Hoogendam et al., 2017; Blair et al., 2010; Hiser & Koenigs, 2018; Northoff et al., 2006).

Finally, it is notable that for people with high SA, the choice of whether to mask oneself may be further influenced by perceived social norms than are other decisions, given the highly politicized nature of mask-wearing in some parts of the world – and therefore associated potential for interpersonal conflict. Given that SA is associated with conflict avoidance (Davila & Beck, 2002) in addition to social norm sensitivity, people with SA might be especially compliant with politicized, conflict-laden social norms where they feel they are likely to be criticized for anti-normative behavior. In cases where mask-wearing is perceived as deviating from social norms, such compliance may be problematic, given that it could result in behavior that is counter to public health guidance and may pose a health risk to both self and others.

Taken together, the self-report, behavioral, and brain activation data suggest that social norm violations are experienced as being threatening because they are interpreted by people with SA as revealing something socially incompetent about them, which they imagine will have catastrophic social consequences such as social rejection or ostracism. In this group, such concerns would be expected to extend to contexts in which they fear their own behavior will be evaluated by others in relation to socially normative expectations around mask-wearing and the degree to which they are perceived as conforming with such norms. For people with SA, the fear and distress associated with confronting conflict within the context of anti-normative mask-wearing, as well as the associated hazardous behaviors themselves (i.e., not wearing a mask), could potentially be mitigated by treating clinicians through a therapeutic focus on helping clients develop skills to increase their tolerance of criticism from others and behave assertively in ways that would meet their own socioemotional, health-related, and idiosyncratic day-to-day needs, especially in the face of conflict (e.g., Padesky, 1997).

Masks as a barrier to the interpretation of social and emotional feedback

Social feedback informs people's perceptions of how others react to and evaluate their social behavior. Social mask-wearing inherently increases the ambiguity of an interaction because the occlusion or absence of facial cues reflecting key social evaluative information increases the uncertainty of potential negative outcomes such as negative evaluation. Indeed, research has shown that occluding

one's facial expressions via masking (Carbon, 2020) and headdresses (Kret & Gelder, 2012) interferes with the identification of the target's emotional expression, likely due to a reduction in the amount of social feedback available. When viewing masked faces, participants are both less accurate at identifying the emotions of a target face and less confident in their judgements (Carbon, 2020).

When access to information indicative of one's social performance is diminished, discomfort may arise. Research indicates that individuals with SA are particularly susceptible to discomfort elicited by ambiguity (Kishimoto & Ding, 2019; Moscovitch & Hofmann, 2007), and that they are likely to interpret ambiguous cues in negative ways (for a review, see Chen et al., 2020). These negative interpretation biases activated by ambiguous social feedback may be further reinforced by post-event rumination in which individuals with SA selectively focus on negative moments and interpretations from recent social encounters (Gavric et al., 2017; Zou & Abbott, 2012), or remember positive or ambiguous moments in more negative ways (Glazier & Alden, 2019; Romano et al., 2020).

In a related vein, intolerance of uncertainty – a disposition toward reacting negatively to uncertain outcomes (Buhr & Dugas, 2006) – is heightened in anxiety disorders as well as other clinical populations (Gentes & Ruscio, 2011). In non-clinical samples, individuals' levels of SA are positively associated with intolerance of uncertainty (Boelen & Reijntjes, 2009; Carleton et al., 2010) and variance in SA levels over time has been shown to correlate with that of intolerance of uncertainty (Shapiro et al., 2020). There is also evidence of this association at the neurological level, where differences in functional connectivity patterns have been associated with SA levels during the processing of unpredictable (i.e., uncertain) images (Clauss et al., 2019).

For individuals with SA, the ambiguity effects associated with mask-wearing may be further amplified by distinctive face processing biases. Various studies have shown both increased and decreased selective attention to threatening faces among people with higher levels of SA (Bantin et al., 2016; Chen & Clarke, 2017; Machado-de-Sousa et al., 2010). These mixed data may be consistent with the vigilant-avoidance model (Garner et al., 2006), which posits that facial processing in people with SA is characterized by a combination of both over-attending to and avoiding others' faces. Thus, within social evaluative contexts, people with SA may exhibit an initial threat response in which they orient more quickly towards emotional faces but subsequently avoid eye contact to mitigate their feelings of discomfort. If facial processing in SA is characterized primarily by attentional avoidance of others' faces generally and specifically by the avoidance of others' eyes, the salience of the ambiguity created by facial occlusion may be lessened, since relatively less attention may have been paid to the unconcluded face in the first place. Conversely, if facial processing in SA is characterized primarily by over-attention to others' faces, then the negative effects of mask-related ambiguity may be heightened, particularly when it comes to interpreting other people's facial expressions.

For individuals with SA, theory of mind abilities may also play a significant role in how accurately they interpret ambiguous facial expressions associated with mask-wearing. To this end, studies have found that people with greater SA infer less information about others' emotions from their eyes. For example, individuals with higher levels of trait SA perform more poorly than healthy participants when completing the Reading the Mind in the Eyes (MIE) task (Baron-Cohen et al., 2001), in which participants are required to identify a displayed emotion from only a set of eyes via a forced-choice paradigm (Hezel & McNally, 2014; Lenton-Brym et al., 2018). Lenton-Brym et al. (2018) found that while individuals higher in SA exhibited worse performance on the MIE task when the eyes displayed a neutral emotion, they exhibited no deficits in another theory of mind task which was unrelated to interpreting emotions from others' eyes. These findings suggest a specific SA-associated deficit in detecting information about others' mood states which is localized to making inferences from others' eyes – precisely the types of inferences that are required when interacting with others whose faces are occluded by masks.

Last, masked interactions might be regarded as more ambiguous if individuals believe that masks may alter or diminish the intensity or intelligibility of one's speech, resulting in audibly-impaired social interactions. Although much of the current research indicates that masks have relatively

little influence on the intelligibility of speech for people with normal hearing (Saunders et al., 2020), it is possible that individuals with SA may nonetheless *perceive* them as a communication barrier. Indeed, Howard (2020) found that a small minority (4%) of individuals cited concerns related to the ease of interacting while wearing a mask as a reason for not wearing one during the coronavirus pandemic. Likewise, in a survey assessing the perceptions of both individuals with normal hearing and impaired hearing of communication with masks during the coronavirus pandemic, Saunders et al. (2020) found that "with few exceptions, participants reported that face coverings negatively impacted hearing, understanding, engagement, and feelings of connection with the speaker" (p. 1). If masks are construed as a barrier to audible communication, people may generally believe that they will either struggle to be understood or to comprehend the sentiments of another person wearing a mask, and individuals higher in SA might fear that they will be criticized or feel excluded as a result.

Even if individuals high in SA do not have concerns about masks affecting the ease of communication, they may nonetheless worry that wearing a mask will cause their voice to sound different, or weaker – if no less intelligible. People with SA tend to perceive their vocal performance as being much more deficient than objective observers rate it as being (Hirsch & Clark, 2007; Lundh et al., 2002) and might believe that others will perceive their vocalizations as flawed when they are wearing a mask, even if this is not the case. Given that a faltering voice is often cited as an indicator of SA (e.g., Hirsch & Clark, 2007) and individuals with SA are concerned about exposing such signs to others (Moscovitch, 2009), the belief that wearing a mask may diminish the intensity of one's voice may increase the perceived likelihood of negative social evaluation when wearing a mask, in turn exacerbating the unease that individuals with SA are likely to already experience during masked interactions.

Taken together, existing research highlights the potential challenges faced by people with SA when attempting to interpret ambiguous facial expressions associated with mask-wearing, or sensing that the audible aspects of an interaction may be unclear. As the ambiguity and uncertainty of social interactions increase, so too would the likelihood of negative interpretation. For people with higher levels of trait SA, masked social encounters may amplify negative interpretation biases by activating their pre-existing vulnerabilities associated with selective memory recall during post-event rumination, vigilant-avoidant facial processing, and diminished theory of mind abilities. Future experimental research is needed to determine whether and to what extent individuals with SA differ in their attention to others' eyes during social interactions, how these differences may affect their interpretation of others' emotions, and how mask-wearing might interact with such processes, both during and after the COVID-19 pandemic. Effective treatment may help people with SAD learn to respond adaptively to the unique challenges associated with mask-wearing through the application of in-person or computerized interventions that target clients' negative interpretation biases by providing them with repeated trials of corrective feedback designed to counteract their negative appraisals of ambiguous social information (e.g., Beard & Amir, 2008).

Mask-wearing as a safety behaviour

Safety behaviors are self-protective behaviors that people use to prevent exposure to a feared outcome (Goetz et al., 2016). As reviewed above, individuals with SAD are fundamentally concerned about other people judging their appearance or behavior, including their facial cues, that may make them appear unattractive, anxious, or socially awkward (Moscovitch & Huyder, 2011). Drawing from this conceptualization, safety behaviors in SA can be conceptualized as self-concealment strategies that are utilized for the intended function of reducing the likelihood of self-exposure that may lead to negative social evaluation (Clark & Wells, 1995; Moscovitch, 2009). Thus, for people with SA, mask-wearing may function as a safety behavior that helps to alleviate wearers' distress about self-exposure and negative evaluation.

The conceptualization of mask-wearing as a safety behavior is readily accommodated by existing, well-established measures of safety behaviors (Piccirillo et al., 2016), including the Social Behaviours Questionnaire (SBQ; Clark et al., 1994) and the Subtle Avoidance Frequency Examination (SAFE; Cuming et al., 2009). These measures were developed well before the pandemic but they contain specific items assessing respondents' motivation to use certain safety behaviors that resemble the function of mask-wearing, including tendencies to "hide your [their] face" and "wear clothes or makeup to hide blushing" (see Clark et al., 1994; Cuming et al., 2009). In support of the connection between facial concealment and motivation to avoid negative evaluation, a survey of respondents from Japan revealed that many participants believed wearing a sanitary mask was an effective way to enhance facial attractiveness, though the authors did not measure whether levels of SA were related to the strength of endorsed beliefs (Miyazaki & Kawahara, 2016). For individuals with higher levels of SA, it is likely that mask-wearing serves the dual functions of preventing contagion and concealing perceived flaws in physical appearance or visible signs of anxiety. Consistent with this proposed dual functionality of masks, recent anecdotal reports of mask-wearing among individuals high in SA during the COVID-19 pandemic suggest that wearing a mask serves as a "security blanket" (Brennan, as cited in Ray, 2020) by reducing their symptoms of anxiety when interacting with others, at least in part by relieving the social pressures that come with fears of exposing flaws in appearance or signs of anxiety (Ray, 2020; Sloat, 2020).

Despite the perception that wearing self-concealing masks may increase comfort and reduce anxiety during social interaction for individuals worried about being negatively evaluated by others, the use of masks as a safety behavior may have unanticipated negative consequences for such individuals. Cognitive–behavioral models of SA have long emphasized the negative effects of safety behaviors, both in terms of preventing people with SA from observing the actual (typically insignificant) consequences of their authentic participation in social situations in the absence of these behaviors, and in terms of "contaminating" the social situation by blocking the potential for making a favorable social impression and developing a strong interpersonal connection with others (see Gray et al., 2019; Piccirillo et al., 2016). Consistent with these models, research has shown that use of safety behaviors actually impairs social performance while increasing anxiety and the prediction of negative social outcomes (Moscovitch et al., 2013; Plasencia et al., 2011; Rowa et al., 2015), even if their use may be perceived by individuals with high SA as anxiety-reducing.

Further supporting the notion that safety behaviors contribute to the persistence of SA symptoms, studies have found that dropping safety behaviors during exposure-based treatment leads to significant symptom improvement (Cougle et al., 2020; McManus et al., 2008; Morgan & Raffle, 1999; Wilver et al., 2020). Although persistent use of safety behaviors is generally considered incompatible with effective treatment of SA, Rachman et al. (2008) suggested that *judicious* use of safety behaviors during therapy might advance treatment of anxiety disorders by increasing the tolerability of exposure exercises and enabling clients to stay in the anxiety-provoking situation and confront their feared stimuli rather than avoid them entirely. Instead of banning safety behaviors completely from treatment, a policy of "judicious use" might enable clinicians to help anxious clients gradually confront their fears, particularly for those with high levels of avoidance who may be unwilling to otherwise engage in exposure therapy. Supporting this view, Goetz et al. (2016) found little evidence of negative treatment outcomes associated with safety behavior usage in their systematic review of the anxiety treatment literature. Similarly, Blakey et al. (2019) tested the effects of safety behavior usage during exposure therapy amongst participants with spider phobia who were randomly assigned to use or drop safety behaviors. Results indicated that participants in the two conditions did not differ in their assessment of the tolerability of the exposure exercises or in their peak distress levels or levels of distress tolerance. However, studies have yet to examine the effects of judicious use of safety behaviors, including mask-wearing, on exposure-based treatment for SA specifically, which is a ripe area for future research.

Taken together, the existing research supports the conceptualization of mask-wearing as a potential safety behavior for people with higher levels of SA. Given the public health guidelines currently

surrounding the mandatory use of masks within various social contexts in countries across the globe, the primary function of mask-wearing remains keeping people safe by preventing the spread of disease. Within such contexts, individuals with SA may benefit from adopting an approach-oriented mindset and focusing on strategies to connect emotionally with others *despite* their use of masks. As we transition to the post-pandemic era and mask-wearing becomes a matter of personal choice, it will likely be important for clinicians to explore whether and when their clients with SA are choosing to wear masks, and for what reasons. A clinical focus on the connection between mask-wearing and safety behaviors may be especially warranted for clients with SAD who continue to wear masks even when physical health risks are low, as well as for those whose mask-wearing contributes to faulty appraisals about social successes, and for those whose mask-wearing enables maladaptive interpersonal avoidance that contributes to loneliness and functional impairment.

Effects of additional coronavirus-prevention measures and pre-existing health anxiety on social anxiety

Aside from mask-wearing, other public health policies of the COVID-19 era may indirectly heighten SA and diminish overall mental health, even while protecting people from contagion. For example, many have cautioned about the potentially deleterious effects that preventative measures such as social distancing can have on interpersonal connection, sense of cohesion, and mental health generally (e.g., Sikali, 2020). In their review of the potential effects of coronavirus lockdown measures on youth with SA, Khan et al. (2021) suggest that coronavirus-related restrictions on socialization might initially reduce SA but, left untreated, have the potential to increase SA in the long run. They aptly note that social distancing precautions necessarily limit opportunities for exposure exercises for people with SA to face their fears by engaging in social interaction, thereby learning that such fears are often exaggerated. In one study conducted prior to the pandemic, individuals with SAD preferred more physical distance between themselves and others in social situations compared to individuals without SAD (Givon-Benjio et al., 2020), supporting the view that such individuals may have initially experienced increased comfort and an associated temporary reduction in anxiety when greater social distance became common practice at the onset of the coronavirus pandemic. However, recent self-report surveys have suggested that the COVID-19 pandemic has increased people's levels of SA and fears of negative evaluation overall, even despite the increases in physical distancing (Hawes et al., 2021; Ho & Moscovitch, 2021). In line with previous recommendations for continued exposure exercises to mitigate SA during the coronavirus pandemic (e.g., Khan et al., 2021), clinicians should encourage clients with SAD to work hard to confront their fears by adopting creative methods of exposure via video-chat platforms and in-person social interactions that can be conducted safely and in compliance with COVID-related restrictions (see Warnock-Parkes et al., 2020).

Moreover, the social and public health consequences of the coronavirus pandemic undoubtably pose unique challenges for the mental health of individuals who have both elevated SA and elevated health anxiety. Research has shown that pre-pandemic anxiety difficulties positively predicted levels of coronavirus anxiety during the first wave of the pandemic (Asmundson et al., 2020; Ho & Moscovitch, 2021), but no research to our knowledge has examined the effects of the coronavirus pandemic on the individuals who have comorbid difficulties with both health and SA (Scarella et al., 2016). Like individuals with high levels of SA but with a different focus of concern, people with health anxiety tend to exhibit negative biases in information processing, excessive self-monitoring, intolerance of uncertainty, and use of safety behaviors such as extreme reassurance seeking from medical professionals (Abramowitz et al., 2002; Warwick & Salkovskis, 1990). The context of the pandemic may diminish their ability to seek medical reassurance, insofar as access to medical professionals is restricted, or such individuals may be continuing to access medical professionals to receive desired reassurance even during this fraught time, perhaps drawing upon scarce resources in an overburdened system. In so far as mask-wearing is concerned, it is conceivable that individuals

with comorbid social and health anxiety would be drawn to mask wearing even more strongly than others, due to their heightened desires to be protected from infection *and* concealed from negative evaluation. Clinicians should carefully assess any clients who are impaired by excessive reliance on mask-wearing in order to identify the specific fears and motivations underlying their behavior and develop an individualized treatment plan to target the elements of their health anxiety and/or SA within a safe and empowering therapy context that reduces functional impairment while validating and supporting clients' understandable struggles during and beyond this uniquely distressing era.

Conclusions and future research directions

To date, little research has directly examined the effects of mask-wearing on SA or on mental health outcomes more generally. Our review explored three preselected factors that we hypothesized to be particularly relevant for the effects of mask-wearing on SA. These were: (a) hypersensitivity to social norms, (b) biases in detection of social and emotional facial cues, and (c) propensity for self-concealment. By selectively highlighting these three issues, we hope to direct researchers and clinicians toward specific factors that may be especially relevant for understanding how mask-wearing influences SA and, in so doing, improve the conceptualization and treatment of SA-related distress during the COVID-19 pandemic and beyond.

Future research is needed investigate how mask-wearing is related to broader social norms and the extent to which personal mask-wearing attitudes and behaviors for individuals with SA may covary with perceived social norm conformity over time as the pandemic progresses and evolves. Additionally, well-designed experimental studies are needed to examine the ways in which people with higher SA interpret social feedback during masked (vs. unmasked) interactions, and whether and how the ambiguity inherent in masked social interactions may fuel negative interpretation biases within such contexts. Clinical research investigating the extent to which individuals with SA rely on masks for the purpose of self-concealment (rather than to preserve their health or follow public health guidelines) may be beneficial in informing the validity of the conceptualization of masks as a safety behavior and, in turn, facilitating more effective CBT that targets each patient's personal vulnerabilities. Such research may also help to improve our understanding of the clinically-relevant effects of social distancing on individuals with high SA, including those with SAD. Finally, future data is needed on how the pandemic context has impacted individuals who suffer from both elevated SA and health anxiety, with the need for data-driven models to guide clinical work targeting the specific mental health challenges that may be associated with this unique population.

The period following the COVID-19 pandemic is likely to be marked by both sudden and gradual transitions in mask-wearing expectations and behaviors as the vaccine reaches increasingly large segments of the population. As mandatory mask-wearing laws become outdated, mask-wearing within certain contexts will become a matter of personal choice; as a result, a greater degree of ambiguity may permeate social encounters, where there will be more uncertainty about how to behave in ways that conform with expected norms. The transitional period as things begin to open up, but only gradually, may be particularly distressing for individuals with high SA, due to an associated increase in their uncertainty and fear about whether and how their personal choices will be scrutinized and judged by those around them.

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References

Abramowitz, J. S., Schwartz, S. A., & Whiteside, S. P. (2002). A contemporary conceptual model of hypochondriasis. *Mayo Clinic Proceedings*, *77*(12), 1323–1330. https://doi.org/10.4065/77.12.1323

Asmundson, G. J. G., Paluszek, M. M., Landry, C. A., Rachor, G. S., McKay, D., & Taylor, S. (2020). Do pre-existing anxiety-related and mood disorders differentially impact COVID-19 stress responses and coping? *Journal of Anxiety Disorders*, *74*, 102271. https://doi.org/10.1016/j.janxdis.2020.102271

Bantin, T., Stevens, S., Gerlach, A. L., & Hermann, C. (2016). What does the facial dot-probe task tell us about attentional processes in social anxiety? A systematic review. *Journal of Behavior Therapy and Experimental Psychiatry*, *50*, 40–51. https://doi.org/10.1016/j.jbtep.2015.04.009

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the Mind in the Eyes" test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry*, *42*(2), 241–251. https://doi.org/10.1017/S0021963001006643

Bas-Hoogendam, J. M., Steenbergen, H. V., Kreuk, T., Wee, N. J. A. V. D., & Westenberg, P. M. (2017). How embarrassing! The behavioral and neural correlates of processing social norm violations. *PLoS ONE*, *12*(4), Article e0176326. https://doi.org/10.1371/journal.pone.0176326

Bas-Hoogendam, J. M., Steenbergen, H. V., Wee, N. J. A., & Westenberg, P. M. (2018). Not intended, still embarrassed: Social anxiety is related to increased levels of embarrassment in response to unintentional social norm violations. *European Psychiatry*, *52*, 15–21. https://doi.org/10.1016/j.eurpsy.2018.03.002

Beard, C., & Amir, N. (2008). A multi-session interpretation modification program: Changes in interpretation and social anxiety symptoms. *Behaviour Research and Therapy*, *46*(10), 1135–1141. https://doi.org/10.1016/j.brat.2008.05.012

Benatti, B., Albert, U., Maina, G., Fiorillo, A., Celebre, L., Girone, N., Fineberg, N., Bramante, S., Rigardetto, S., & Dell'Osso, B. (2020). What happened to patients with obsessive compulsive disorder during the COVID-19 pandemic? A multicentre report from tertiary clinics in northern Italy. *Frontiers in Psychiatry*, *11*. https://doi.org/10.3389/fpsyt.2020.00720

Betsch, C., Korn, L., Sprengholz, P., Felgendreff, L., Eitze, S., Schmid, P., & Böhm, R. (2020). Social and behavioral consequences of mask policies during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences*, *117*(36), 21851–21853. https://doi.org/10.1073/pnas.2011674117

Blair, K. S., Geraci, M., Hollon, N., Otero, M., DeVido, J., Majestic, C., Jacobs, M., Blair, R., & Pine, D. S. (2010). Social norm processing in adult social phobia: Atypically increased ventromedial frontal cortex responsiveness to unintentional (embarrassing) transgressions. *American Journal of Psychiatry*, *167*(12), 1526–1532. https://doi.org/10.1176/appi.ajp.2010.09121797

Blakey, S. M., Abramowitz, J. S., Buchholz, J. L., Jessup, S. C., Jacoby, R. J., Reuman, L., & Pentel, K. Z. (2019). A randomized controlled trial of the judicious use of safety behaviors during exposure therapy. *Behaviour Research and Therapy*, *112*, 28–35. https://doi.org/10.1016/j.brat.2018.11.010

Boelen, P. A., & Reijntjes, A. (2009). Intolerance of uncertainty and social anxiety. *Journal of Anxiety Disorders*, *23*(1), 130–135. https://doi.org/10.1016/j.janxdis.2008.04.007

Buhr, K., & Dugas, M. J. (2006). Investigating the construct validity of intolerance of uncertainty and its unique relationship with worry. *Journal of Anxiety Disorders*, *20*(2), 222–236. https://doi.org/10.1016/j.janxdis.2004.12.004

Burgess, A., & Horii, M. (2012). Risk, ritual and health responsibilisation: Japan's `safety blanket' of surgical face mask-wearing. *Sociology of Health & Illness*, *34*(8), 1184–1198. https://doi.org/10.1111/j.1467-9566.2012.01466.x

Carbon, C. (2020). Wearing face masks strongly confuses counterparts in reading emotions. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.566886

Carleton, R. N., Collimore, K. C., & Asmundson, G. J. G. (2010). "It's not just the judgements—It's that I don't know": Intolerance of uncertainty as a predictor of social anxiety. *Journal of Anxiety Disorders*, *24*(2), 189–195. https://doi.org/10.1016/j.janxdis.2009.10.007

Chen, N. T. M., & Clarke, P. J. F. (2017). Gaze-based assessments of vigilance and avoidance in social anxiety: A review. *Current Psychiatry Reports*, *19*(9). https://doi.org/10.1007/s11920-017-0808-4

Chen, J., Short, M., & Kemps, E. (2020). Interpretation bias in social anxiety: A systematic review and meta-analysis. *Journal of Affective Disorders*, *276*, 1119–1130. https://doi.org/10.1016/j.jad.2020.07.121

Clark, D. M., Butler, G., Fennell, M., Hackmann, A., McManus, F., & Wells, A. (1994). Social Behaviour Questionnaire. Unpublished manuscript. Questionnaire downloaded from https://oxcadatresources.com/questionnaires

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In R. G. Heimberg, M. R. Liebowitz, D. A. Hope, & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (pp. 69–93). The Guilford Press.

Clauss, J. A., Avery, S. N., Benningfield, M. M., & Blackford, J. U. (2019). Social anxiety is associated with BNST response to unpredictability. *Depression and Anxiety*, *36*(8), 666–675. https://doi.org/10.1002/da.22891

Clements, J. M. (2020). Knowledge and behaviors toward COVID-19 among US residents during the early days of the pandemic: Cross-sectional online questionnaire. *JMIR Public Health and Surveillance*, *6*(2), e19161. https://doi.org/10.2196/19161

Cougle, J. R., Mueller, N. E., McDermott, K. A., Wilver, N. L., Carlton, C. N., & Okey, S. A. (2020). Text message safety behavior reduction for social anxiety: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *88*(5), 445–454. https://doi.org/10.1037/ccp0000494

Cuming, S., Rapee, R. M., Kemp, N., Abbott, M. J., Peters, L., & Gaston, J. E. (2009). A self-report measure of subtle avoidance and safety behaviors relevant to social anxiety: Development and psychometric properties. *Journal of Anxiety Disorders*, *23*(7), 879–883. https://doi.org/10.1016/j.janxdis.2009.05.002

Davila, J., & Beck, J. G. (2002). Is social anxiety associated with impairment in close relationships? A preliminary investigation. *Behavior Therapy*, *33*(3), 427–446. https://doi.org/10.1016/S0005-7894(02)80037-5

Dozois, D. J. A., & Mental Health Research Canada. (2020). Anxiety and depression in Canada during the COVID-19 pandemic: A national survey. *Canadian Psychology/Psychologie Canadienne*. https://doi.org/10.1037/cap0000251

Fung, K., Moscovitch, D. A., & Rodebaugh, T. L. (2016). Examining the focusing illusion as a cognitive mechanism underlying catastrophic perceptions of social blunders in socially anxious individuals. *Journal of Social and Clinical Psychology*, *35*(4), 289–300. https://doi.org/10.1521/jscp.2016.35.4.289

Garner, M., Mogg, K., & Bradley, B. P. (2006). Orienting and maintenance of gaze to facial expressions in social anxiety. *Journal of Abnormal Psychology*, *115*(4), 760–770. https://doi.org/10.1037/0021-843X.115.4.760

Gavric, D., Moscovitch, D. A., Rowa, K., & McCabe, R. E. (2017). Post-event processing in social anxiety disorder: Examining the mediating roles of positive metacognitive beliefs and perceptions of performance. *Behaviour Research and Therapy*, *91*, 1–12. https://doi.org/10.1016/j.brat.2017.01.002

Gentes, E. L., & Ruscio, A. M. (2011). A meta-analysis of the relation of intolerance of uncertainty to symptoms of generalized anxiety disorder, major depressive disorder, and obsessive-compulsive disorder. *Clinical Psychology Review*, *31*(6), 923–933. https://doi.org/10.1016/j.cpr.2011.05.001

Givon-Benjio, N., Oren-Yagoda, R., Aderka, I. M., & Okon-Singer, H. (2020). Biased distance estimation in social anxiety disorder: A new avenue for understanding avoidance behavior. *Depression and Anxiety*, *37*(12), 1243–1252. https://doi.org/10.1002/da.23086

Glazier, B. L., & Alden, L. E. (2019). Social anxiety disorder and memory for positive feedback. *Journal of Abnormal Psychology*, *128*(3), 228–233. https://doi.org/10.1037/abn0000407

Godbersen, H., Hofmann, L. A., & Ruiz-Fernández, S. (2020). How people evaluate anti-corona measures for their social spheres: Attitude, subjective norm, and perceived behavioral control. *Frontiers in Psychology*, *11*, 2851. https://doi.org/10.3389/fpsyg.2020.567405

Goetz, A. R., Davine, T. P., Siwiec, S. G., & Lee, H. (2016). The functional value of preventive and restorative safety behaviors: A systematic review of the literature. *Clinical Psychology Review*, *44*, 112–124. https://doi.org/10.1016/j.cpr.2015.12.005

Gray, E., Beierl, E. T., & Clark, D. M. (2019). Sub-types of safety behaviours and their effects on social anxiety disorder. *PLoS ONE*, *14*(10), e0223165. https://doi.org/10.1371/journal.pone.0223165

Haischer, M. H., Beilfuss, R., Hart, M. R., Opielinski, L., Wrucke, D., Zirgaitis, G., Uhrich, T. D., & Hunter, S. K. (2020). Who is wearing a mask? Gender-, age-, and location-related differences during the COVID-19 pandemic. *PLoS ONE*, *15*(10), e0240785. https://doi.org/10.1371/journal.pone.0240785

Hawes, M. T., Szenczy, A. K., Klein, D. N., Hajcak, G., & Nelson, B. D. (2021). Increases in depression and anxiety symptoms in adolescents and young adults during the COVID-19 pandemic. *Psychological Medicine*, 1–9. https://doi.org/10.1017/S0033291720005358

Hearne, B. N., & Niño, M. D. (2021). Understanding how race, ethnicity, and gender shape mask-wearing adherence during the COVID-19 pandemic: Evidence from the COVID impact survey. *Journal of Racial and Ethnic Health Disparities*. https://doi.org/10.1007/s40615-020-00941-1

Heinrichs, N., Rapee, R. M., Alden, L. A., Bögels, S., Hofmann, S. G., Oh, K. J., & Sakano, Y. (2006). Cultural differences in perceived social norms and social anxiety. *Behaviour Research and Therapy*, *44*(8), 1187–1197. https://doi.org/10.1016/j.brat.2005.09.006

Hezel, D. M., & McNally, R. J. (2014). Theory of mind impairments in social anxiety disorder. *Behavior Therapy*, *45*(4), 530–540. https://doi.org/10.1016/j.beth.2014.02.010

Hirsch, C. R., & Clark, D. M. (2007). Imagery special issue: Underestimation of auditory performance in social phobia and the use of audio feedback. *Journal of Behavior Therapy and Experimental Psychiatry*, *38*(4), 447–458. https://doi.org/10.1016/j.jbtep.2007.08.004

Hiser, J., & Koenigs, M. (2018). The multifaceted role of the ventromedial prefrontal cortex in emotion, decision making, social cognition, and psychopathology. *Biological Psychiatry*, *83*(8), 638–647. https://doi.org/10.1016/j.biopsych.2017.10.030

Ho, J. T. K., & Moscovitch, D. A. (2021). Effects of pre-existing social anxiety on mental health outcomes during the COVID-19 Pandemic. [Manuscript submitted for publication]. Department of Psychology and Centre for Mental Health Research and Treatment, University of Waterloo.

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behaviour Therapy*, *36*(4), 193–209. https://doi.org/10.1080/16506070701421313

Hofmann, S. G., Asnaani, M. A. A., & Hinton, D. E. (2010). Cultural aspects in social anxiety and social anxiety disorder. *Depression and Anxiety*, *27*(12), 1117–1127. https://doi.org/10.1002/da.20759

Howard, M. C. (2020). Understanding face mask use to prevent coronavirus and other illnesses: Development of a multidimensional face mask perceptions scale. *British Journal of Health Psychology*, *25*(4), 912–924. https://doi.org/10.1111/bjhp.12453

Katz, J., Sanger-Katz, M., & Quealy, K. (2020, July 17). A detailed map of who is wearing masks in the U.S. *The New York Times*. https://www.nytimes.com/interactive/2020/07/17/upshot/coronavirus-face-mask-map.html

Kessler, R. C., Petukhova, M., Sampson, N. A., Zaslavsky, A. M., & Wittchen, H. U. (2012). Twelve-month and lifetime prevalence and lifetime morbid risk of anxiety and mood disorders in the United States. *International Journal of Methods in Psychiatric Research*, *21*(3), 169–184. https://doi.org/10.1002/mpr.1359

Khan, A. N., Bilek, E., Tomlinson, R. C., & Becker-Haimes, E. M. (2021). Treating social anxiety in an era of social distancing: Adapting exposure therapy for youth during COVID-19. *Cognitive and Behavioral Practice*. Advance online publication. https://doi.org/10.1016/j.cbpra.2020.12.002

Kishimoto, T., & Ding, X. (2019). The influences of virtual social feedback on social anxiety disorders. *Behavioural and Cognitive Psychotherapy*, *47*(6), 726–735. https://doi.org/10.1017/S1352465819000377

Kleinknecht, R. A., Dinnel, D. L., Kleinknecht, E. E., Hiruma, N., & Harada, N. (1997). Cultural factors in social anxiety: A comparison of social phobia symptoms and taijin kyofusho. *Journal of Anxiety Disorders*, *11*(2), 157–177. https://doi.org/10.1016/s0887-6185(97)00004-2

Kret, M. E., & Gelder, B. D. (2012). Islamic headdress influences how emotion is recognized from the eyes. *Frontiers in Psychology*, *3*, Article 110. https://doi.org/10.3389/fpsyg.2012.00110

Lenton-Brym, A. P., Moscovitch, D. A., Vidovic, V., Nilsen, E., & Friedman, O. (2018). Theory of mind ability in high socially anxious individuals. *Anxiety, Stress, & Coping*, *31*(5), 487–499. https://doi.org/10.1080/10615806.2018.1483021

Lundh, L., Berg, B., Johansson, H., Nilsson, L. K., Sandberg, J., & Segerstedt, A. (2002). Social anxiety is associated with a negatively distorted perception of one's own voice. *Cognitive Behaviour Therapy*, *31*(1), 25–30. https://doi.org/10.1080/16506070252823634

Machado-de-Sousa, J. P., Arrais, K. C., Alves, N. T., Chagas, M. H. N., Meneses-Gaya, C., Crippa, J. A. S., & Hallak, J. E. C. (2010). Facial affect processing in social anxiety: Tasks and stimuli. *Journal of Neuroscience Methods*, *193*(1), 1–6. https://doi.org/10.1016/j.jneumeth.2010.08.013

McDonald, R. I., & Crandall, C. S. (2015). Social norms and social influence. *Current Opinion in Behavioral Sciences*, *3*, 147–151. https://doi.org/10.1016/j.cobeha.2015.04.006

McManus, F., Sacadura, C., & Clark, D. M. (2008). Why social anxiety persists: An experimental investigation of the role of safety behaviours as a maintaining factor. *Journal of Behavior Therapy and Experimental Psychiatry*, *39*(2), 147–161. https://doi.org/10.1016/j.jbtep.2006.12.002

Miyazaki, Y., & Kawahara, J. (2016). The sanitary-mask effect on perceived facial attractiveness. *Japanese Psychological Research*, *58*(3), 261–272. https://doi.org/10.1111/jpr.12116

Morgan, H., & Raffle, C. (1999). Does reducing safety behaviours improve treatment response in patients with social phobia? *Australian and New Zealand Journal of Psychiatry*, *33*(4), 503–510. https://doi.org/10.1046/j.1440-1614.1999.00599.x

Moscovitch, D. A. (2009). What is the core fear in social phobia? A new model to facilitate individualized case conceptualization and treatment. *Cognitive and Behavioral Practice*, *16*(2), 123–134. https://doi.org/10.1016/j.cbpra.2008.04.002

Moscovitch, D. A., & Hofmann, S. G. (2007). When ambiguity hurts: Social standards moderate self-appraisals in generalized social phobia. *Behaviour Research and Therapy*, *45*(5), 1039–1052. https://doi.org/10.1016/j.brat.2006.07.008

Moscovitch, D. A., & Huyder, V. (2011). The negative self-portrayal scale: Development, validation, and application to social anxiety. *Behavior Therapy*, *42*(2), 183–196. https://doi.org/10.1016/j.beth.2010.04.007

Moscovitch, D. A., Rowa, K., Paulitzki, J. R., Ierullo, M. D., Chiang, B., Antony, M. M., & McCabe, R. E. (2013). Self-portrayal concerns and their relation to safety behaviors and negative affect in social anxiety disorder. *Behaviour Research and Therapy*, *51*(8), 476–486. https://doi.org/10.1016/j.brat.2013.05.002

Moscovitch, D. A., Waechter, S., Bielak, T., Rowa, K., & McCabe, R. E. (2015). Out of the shadows and into the spotlight: Social blunders fuel fear of self-exposure in social anxiety disorder. *Journal of Anxiety Disorders*, *34*, 24–32. https://doi.org/10.1016/j.janxdis.2015.06.004

Nakayachi, K., Ozaki, T., Shibata, Y., & Yokoi, R. (2020). Why do Japanese people use masks against COVID-19, even though masks are unlikely to offer protection from infection? *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.01918

Northoff, G., Heinzel, A., Greck, M. D., Bermpohl, F., Dobrowolny, H., & Panksepp, J. (2006). Self-referential processing in our brain—A meta-analysis of imaging studies on the self. *Neuroimage*, *31*(1), 440–457. https://doi.org/10.1016/j.neuroimage.2005.12.002

Padesky, C. (1997). A more effective treatment focus for social phobia? *International Cognitive Therapy Newsletter*, *11*(1), 1–3.

Piccirillo, M. L., Dryman, M. T., & Heimberg, R. G. (2016). Safety behaviors in adults with social anxiety: Review and future directions. *Behavior Therapy*, *47*(5), 675–687. https://doi.org/10.1016/j.beth.2015.11.005

Plasencia, L., Alden, L. E., & Taylor, T. (2011). Differential effects of safety behaviour subtypes in social anxiety disorder. *Behaviour Research and Therapy*, *49*(10), 665–675. https://doi.org/10.1016/j.brat.2011.07.005

Rachman, S., Radomsky, A. S., & Shafran, R. (2008). Safety behaviour: A reconsideration. *Behaviour Research and Therapy*, *46*(2), 163–173. https://doi.org/10.1016/j.brat.2007.11.008

Rader, B., White, L. F., Burns, M. R., Chen, J., Brilliant, J., Cohen, J., Shaman, J., Brilliant, L., Kraemer, M. U. G., Hawkins, J. B., Scarpino, S. V., Astley, C. M., & Brownstein, J. S. (2021). Mask-wearing and control of SARS-CoV-2 transmission in the USA: A cross-sectional study. *The Lancet Digital Health*, *3*(3), e148–e157. https://doi.org/10.1016/S2589-7500(20)30293-4

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*(8), 741–756. https://doi.org/10.1016/S0005-7967(97)00022-3

Ray, E. (2020, September 26). Masking anxiety: New Yorkers find boost of confidence with COVID-19 face masks. *New York Daily News*. https://www.nydailynews.com/new-york/ny-coronavirus-masks-social-anxiety-20200926-uxg46bsmrrgfnh43qtu4ovjqpe-story.html

Romano, M., Tran, E., & Moscovitch, D. A. (2020). Social anxiety is associated with impaired memory for imagined social events with positive outcomes. *Cognition and Emotion*, *34*(4), 700–712. https://doi.org/10.1080/02699931.2019.1675596

Rossi, R., Socci, V., Talevi, D., Mensi, S., Niolu, C., Pacitti, F., Di Marco, A., Rossi, A., Siracusano, A., & Di Lorenzo, G. (2020). COVID-19 pandemic and lockdown measures impact on mental health among the general population in Italy. *Frontiers in Psychiatry*, *11*, 790. https://doi.org/10.3389/fpsyt.2020.00790

Rowa, K., Paulitzki, J. R., Ierullo, M. D., Chiang, B., Antony, M. M., McCabe, R. E., & Moscovitch, D. A. (2015). A false sense of security: Safety behaviors erode objective speech performance in individuals with social anxiety disorder. *Behavior Therapy*, *46*(3), 304–314. https://doi.org/10.1016/j.beth.2014.11.004

Saunders, G. H., Jackson, I. R., & Visram, A. S. (2020). Impacts of face coverings on communication: An indirect impact of COVID-19. *International Journal of Audiology*, 1–12. https://doi.org/10.1080/14992027.2020.1851401

Scarella, T. M., Laferton, J. A. C., Ahern, D. K., Fallon, B. A., & Barsky, A. (2016). The relationship of hypochondriasis to anxiety, depressive, and somatoform disorders. *Psychosomatics*, *57*(2), 200–207. https://doi.org/10.1016/j.psym.2015.10.006

Shapiro, M. O., Short, N. A., Morabito, D., & Schmidt, N. B. (2020). Prospective associations between intolerance of uncertainty and psychopathology. *Personality and Individual Differences*, *166*. https://doi.org/10.1016/j.paid.2020.110210

Sikali, K. (2020). The dangers of social distancing: How COVID-19 can reshape our social experience. *Journal of Community Psychology*, *48*(8), 2435–2438. https://doi.org/10.1002/jcop.22430

Sim, S., Moey, K., & Tan, N. (2014). The use of facemasks to prevent respiratory infection: A literature review in the context of the health belief model. *Singapore Medical Journal*, *55*(3). https://doi.org/10.11622/smedj.2014037

Sloat, S. (2020, August 17). *Coronavirus masks have an unintended effect on socially anxious people*. Inverse. https://www.inverse.com/mind-body/social-anxiety-coronavirus-masks

Spurr, S., & Stopa, L. (2002). Self-focused attention in social phobia and social anxiety. *Clinical Psychology Review*, *22*(7), 947–975. https://doi.org/10.1016/s0272-7358(02)00107-1

Szczesniak, D., Ciulkowicz, M., Maciaszek, J., Misiak, B., Luc, D., Wieczorek, T., Witecka, K., & Rymaszewska, J. (2020). Psychopathological responses and face mask restrictions during the COVID-19 outbreak: Results from a nationwide survey. *Brain, Behavior, and Immunity*, *87*, 161–162. https://doi.org/10.1016/j.bbi.2020.05.027

Wang, C., Chudzicka-Czupała, A., Grabowski, D., Pan, R., Adamus, K., Wan, X., Hetnał, M., Tan, Y., Olszewska-Guizzo, A., Xu, L., McIntyre, R., Quek, J., Ho, R., & Ho, C. (2020). The association between physical and mental health and face mask use during the COVID-19 pandemic: A comparison of two countries with different views and practices. *Frontiers in Psychiatry*, *11*. https://doi.org/10.3389/fpsyt.2020.569981

Warnock-Parkes, E., Wild, J., Thew, G. R., Kerr, A., Grey, N., Stott, R., Ehlers, A., & Clark, D. M. (2020). Treating social anxiety disorder remotely with cognitive therapy. *The Cognitive Behaviour Therapist*, *13*, e30. https://doi.org/10.1017/S1754470X2000032X

Warwick, H. M. C., & Salkovskis, P. M. (1990). Hypochondriasis. *Behaviour Research and Therapy*, *28*(2), 105–117. https://doi.org/10.1016/0005-7967(90)90023-c

Wilver, N. L., Summers, B. J., & Cougle, J. R. (2020). Effects of safety behavior fading on appearance concerns and related symptoms. *Journal of Consulting and Clinical Psychology*, *88*(1), 65–74. https://doi.org/10.1037/ccp0000453

Xu, P., & Cheng, J. (2021). Individual differences in social distancing and mask-wearing in the pandemic of COVID-19: The role of need for cognition, self-control and risk attitude. *Personality and Individual Differences*, *175*, 110706. https://doi.org/10.1016/j.paid.2021.110706

Zou, J. B., & Abbott, M. J. (2012). Self-perception and rumination in social anxiety. *Behaviour Research and Therapy*, *50*(4), 250–257. https://doi.org/10.1016/j.brat.2012.01.007